ICT AND DISASTER RISK REDUCTION DIVISION

A Climate Resilient ICT Sector in the Mongolia

Action Plan and Policy Recommendations Framework

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I. The ICT sector's climate vulnerabilities and challenges

This section summarizes climate change and related natural hazards' vulnerabilities of the ICT sector in Mongolia. More detailed information can be found in the ESCAP report Mongolia - Climate Change and Disaster Risk Profile, March 2021.

A. ICT Sector Overview

Information communication and technology (ICT) is an important and rapidly emerging sector of the Mongolian economy (ESCAP, 2019). Between 2017 and 2018, the number of mobile telecommunication subscribers in the country increased by 10.5%, the number of mobile broadband subscribers increased by 20.8% and the number of fixed internet subscribers increased by 7.3%. The fibre-optic network deployment increased by 2.5 times from 2001 to 2017, covering over 38,000km. This allowed parts of the rural population living in remote territories to access high speed internet and mobile connectivity. According to an ESCAP assessment, a **10% increase in broadband access leads to a 1% increase in the GDP** and doubling the average broadband speed can increase the country's GDP by 0.3% (ESCAP, 2020).

Mongolia set the goal to provide internet coverage for 70% of the population by 2020, 90% of the population by 2025 and 95% of the population by 2030 (Mongolia Sustainable Development Vision 2030, 2016). However, according to the International Telecommunication Union (ITU) World Telecommunication, ICT Indicators Database, the percentage of individuals using internet in Mongolia in 2019 was 51.1%, just below the global average of 51.4% (ITU, 2020). Data collected by DataReportal in 2021 indicated 294,000 new internet users in Mongolia between 2020 and 2021. This would make **a total internet coverage of 61% of the population in January 2021** (DataReportal, 2021).

B. Climate Change Impacts on the ICT Sector

The ICT sector shows signs of vulnerability to both the future temperature and the precipitation anticipated patterns.

The RCP 4.5 scenario (50th percentile) **anticipates an increase of the annual average temperature by 2.1ºC** for an intermediate future period of 2040-2059 in comparison with a reference period of 1986-2005. Increasing extreme temperatures may impact ICT services across the country. Exposure to high temperatures may lead to an increase in the ground surface temperature, hence decreasing the conductivity and performance of underground cables. It is estimated that **for temperatures above 55°C the underground cable capacity is lost by 29%**. A temperature rise also reduces the signal range and affects the quality of wireless transmissions. The increase in the number of hot days and drought conditions in the country may affect the telecommunication equipment. An increase in the maximum temperature and in the number of hot days (heat waves) may also cause overheating of mobile towers (ITU, 2018).

A 2.3 mm increase in monthly precipitation by 2040-2059 under RCP 4.5 and resulting occasional localised intensified rainfalls may damage terrestrial cables, mobile towers, destroy underground ducts and thus cause a network failure as well as a disruption of ICT broadband services (ITU, 2014). Dzud events with extreme cold and heavy snowfall may damage cables and cause failures in mobile towers since ice and snow may accumulate in the insulation and cause a flashover

C. Climate Change Vulnerabilities of the Energy Infrastructure

Climate change may affect the ICT infrastructure in two ways: by gradual or incremental climate change patterns (such as gradually increasing average surface mean temperature) and by changing extreme weather events patterns (such as intensified and more frequent heat waves). Climate change may intensify natural disaster risks (droughts, floods) or have a less direct relationship to them (earthquakes).

Climate change vulnerability depends not only on climate change patterns themselves, but as much on the **specifics of the ICT sector assets**. Understanding how exactly and to what extent infrastructural assets are likely to be affected by climate change hence requires a thorough engineering analysis of each specific asset. However, a number of **well identified cause-to-effect patterns** can be taken into consideration when looking into climate proofing the ICT sector. **Table 1** below summarises these cause-to-effect patterns relevant to the ICT sector in Mongolia.

Table 1: Climate change impact on the ICT sector

Climate change pattern	Potential impact on the ICT sector in Mongolia
Increased average and extreme temperatures	▪ Decreased conductivity and performance of underground cables ▪ Reduced efficiency of wireless transmission ▪ Overheating of data centres ▪ Health risk among maintenance staff
Changes in precipitation patterns	▪ Heavy rainfalls and winter snowfalls may weaken the quality and reliability of wireless transmission signals
Climate related natural disasters	
Heatwaves and droughts	▪ Reduced efficiency of underground cables, risk of overheating mobile towers ▪ Reduced efficiency of wireless transmission
Floods	▪ Damage to physical infrastructure
Dzud	▪ Potential failures in mobile towers ▪ Potential damage of cables

Source: ESCAP, 2021

II. Existing Institutional and Policy Framework

A. Existing Institutional Framework

ICT Sector

Communication and Information Technology Authority (CITA) acts a regulatory agency. It develops regulations and policies on space technology, communications, information technology, post, broadcasting, innovation, information security and e-government as well as determines development strategies of the sector and provides policy guidance (CITA, 2021). According to Mongolia's Sustainable Development Vision 2050 and Action Plan 2021 - 2024, ICT is one of the prioritized economic sectors to be developed by CITA (Cabinet Secretariat of Mongolia, 2020).

Communications Regulatory Commission (CRC) of Mongolia has a mandate to plan and administer laws and regulations related to telecommunications and ICT, such as the Communication Law of Mongolia 1995 (CRC, 2021). CRC's main objectives in the ICT sector are to facilitate access to safe, reliable and affordable ICT networks as well as to support innovation and expansion in ICT.

CITA and CRC cooperate to envision, advance and regulate the ICT sector in Mongolia. Established since 2004 with the former name ITPTA, CITA contributed to the start of E-Mongolia National Programme and the launching of ICT Vision 2021, the country's earlier umbrella ICT development plan (Oxford Business Group, 2015). CRC's developed proposals and recommendations for the state policy on communications, which set an initial legal framework for the ICT sector (CRC, 2021). CITA and CRC also support regulation of satellite communication in Mongolia (Bataa, 2017).

The country has been very active in developing ICT related policies over the last two decades: Concept of ICT Development of Mongolia by 2010 (1999-2010); Mid-term Strategy Plan to Develop ICT (2002-2006); 'E-Mongolia' National Program (2005-2012); 'E-Governance' National Program (2012-2016); National Program on Information Security (2010-2015); and Program on High-speed Broadband Network (2011-2015) (CITA, 2021).

Most recent policies include the **Sustainable Development Vision up to 2050**, which aims to make Mongolia a digital nation by bringing digitalization into all sectors of the economy, and the State Policy on the Development of ICT up to 2025, approved in 2017, and to be implemented in two consecutive phases: mid-term (2017 to 2020) and long-term (2021 to 2025). The Vision's recent update includes digitalization into all chapters of the document (UN Mongolia, 2021): all sectors must consider the utilization of ICT in order to make Mongolia a full-fledged digital nation.

The UN Mongolia virtual meeting held in April 2021 identified 6 goals to achieve this vision:

- Infrastructures preventing disconnection due to COVID-19;
- Strengthening digital governance;
- Strengthening the cyber security system;
- Improving population's digital literacy;
- Accelerating digital education;
- Innovating and producing digital content to better promote the country internationally and diversify the economy.

The **State Policy on The Development of Information and Communications Technology (2017-2025)** acts as an umbrella ICT development plan. Its first phase (2017 – 2020) focused on improving ICT's legal environment, expanding the infrastructure capacity, developing highly-skilled human resources and bringing innovation into the ICT sector. Its next phase (2021 - 2025) is to focus on creating an economically efficient technologically inclined industry to ensure the ICT sector's competitiveness and promoting the country's digital economy (CITA, 2021).

Climate Change and Disaster Risk Management

The Ministry of Nature, Environment and Tourism (MNET) includes the **Environment and Climate Fund (ECF)**, which in 2017 was reorganised from the Nature Conservation Fund established back in 1998. The ECF is in charge of collecting nature conservation and climate related data, as well as of implementing climate change related projects (Environment and Climate Fund, 2021). It prepares National Communications in the frame of the UNFCCC and acts as a secretary to the Green Climate Fund (GCF).

In 2019, the country started preparing its **National Adaptation Plan (NAP)** with support from UNDP and funded by the GCF. The latter has also funded over USD 436 million worth 10 Mongolia's climate adaptation and mitigation projects whose executing entities have also been sectoral ministries. For instance, the 2021 Aimags and Soums Green Development Investment Program (ASDIP) involves the Ministry of Finance and the Ministry of Construction and Urban Development (Green Climate Fund; ADB, 2021). The Mongolian Sustainable Finance Association (MSFA) received GCF's support in establishing the **Mongolia Green Finance Corporation**, which aims to reduce CO2 emissions at the household and businesses levels, especially in Ulaanbaatar City (Green Climate Fund; XacBank, 2020).

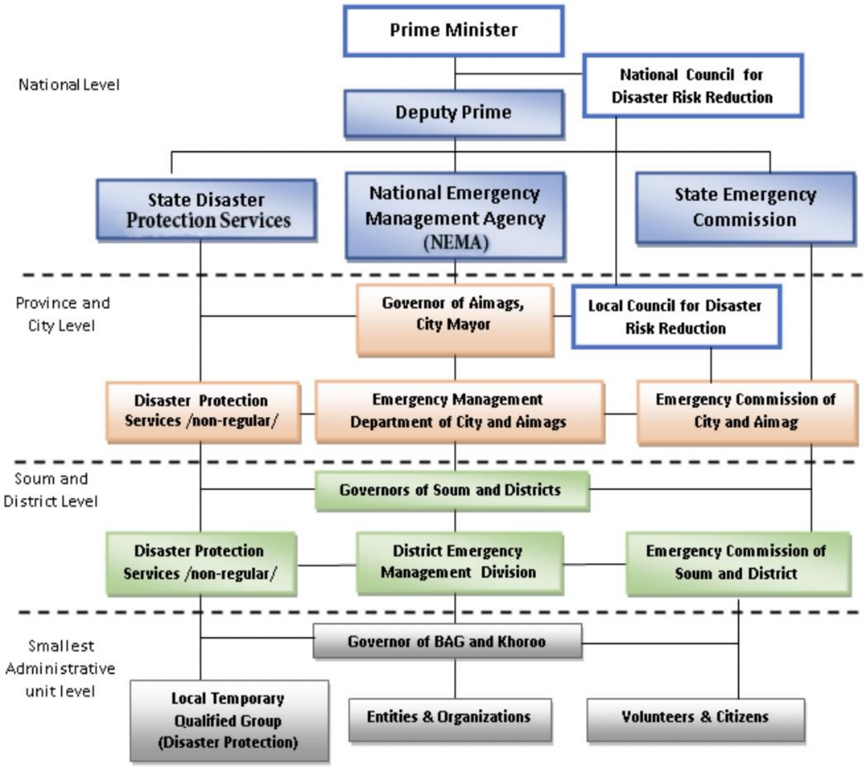
Mongolia's amended **Law on Disaster Protection (2017)** shifted the country's focus from disaster response to a proactive approach of disaster prevention, risk reduction, mitigation and resilience (UNDRR, 2019). The law also regulates coordination between institutions such as the National Emergency Management Agency, National Council on Disaster Risk Reduction, State Emergency Commission, State Services of Disaster Protection, State and Local Authorities, as well as private entities and citizens (NEMA, 2021).

The **National Emergency Management Agency (NEMA)** was created in accordance with the law on Disaster Protection in adopted in 2003. It coordinates local disaster management departments, and ensures national safety by planning, supporting, implementing and monitoring disaster management policies, measures, executing entities, including district levels (NEMA, 2021). It also promotes citizen disaster awareness and participation into prevention.

Following the amendment of the Law on Disaster Protection in 2017, the **National and Local Councils on Disaster Risk Reduction** were established to ensure cooperation between public and private sectors, foster cross-sectoral collaboration and public participation, and provide disaster prevention policy recommendations (ESCAP, 2020). To address emergency situations, the law mandated the **State Emergency Commission** at the national level and Emergency Commissions at the province and the district levels to organize promptly the urgent disaster protection activities as well as coordinate and monitor measures undertaken in relation with the disaster situation (GoM, 2017).

The resolution 118 (2014) Plan to Strengthen the National Earthquake Disaster Risk Reduction Capacity placed the **Standing Committee for Earthquake Disaster Prevention** to act as an executing entity on preventing earthquake disasters (JICA, 2018). In addition, national, province and district level governments are entitled to establish a supplementary entity such as a Non-Permanent Disaster Protection Service or Community-based Volunteer Groups to help them coordinate disaster risk reduction (DRR) activities (GoM, 2017).

Figure 1: National disaster protection institutional framework in Mongolia



Source: (ESCAP, 2020)

Mongolia's climate change adaptation and resilience policies are currently under development with the NAP placed at the core of this effort. The Nationally Determined Contribution (NDC), approved in November 2019, mentions this ongoing effort and broadly puts an emphasis on co-benefits between mitigation and adaptation actions, as well as on nature-based solutions. The Sustainable Development Vision 2050, developed in 2020, broadly brings climate change and disaster risk reduction into the scope, in particular with respect to sustainable agriculture, sustainable management of natural resources, and developing a risk-free city. It does not contain any specific ICT related provisions, although the State Policy on The Development of Information and Communications Technology (2017-2025), developed 3 years earlier than the Vision 2050, sets ensuring 'reliability and security of communications network and service during disaster and extreme weather conditions' as an objective.

B. Ongoing ICT Projects and Remaining Challenges

Ongoing Projects and Investments

ICT infrastructure co-deployment with transport and energy sectors

ESCAP's Research Report on ICT Infrastructure Co-deployment with Transport and Energy Infrastructure in Mongolia highlighted cross-sectoral collaboration opportunities to achieve integrated national development (ESCAP, 2019). Among most co-beneficial solutions:

Transport sector and ICT

- ICT can enhance the intelligent transport system (ITS) and optimize traffic management;
- Newly planned paved road projects should be combined with ICT infrastructure.

Energy sector and ICT

- Interconnected power grid can be complemented with fibre-optic cable to simultaneously broaden areas covered by electricity and fast speed internet connection. This approach could, in particular, be mainstreamed into the upcoming large-scale project Northeast Asia Regional Power System Interconnection, which covers 5 countries of Japan, Korea, Mongolia, People's Republic of China and Russian Federation (ESCAP, 2019);
- This simultaneous approach helps avoid damages related to installing fibre-optic cables on the top of the existing power grid.

Mainstreaming ICT into the country's education system

With support from the UN COVID-19 Response and Recovery Fund (COVID-19 MPTF), Mongolia aims to mainstream ICT at all levels of its **education system** (UNESCO, 2021). COVID-19 pandemic caused a prolonged closure of all schools and educational institutions in early 2020, which made the importance of ICT within the education system very apparent. The use of e-learning requires a strong and widely spread ICT network coverage. UNESCO hence currently assists the country with developing a solid ICT master plan for the education sector, as well as with reviewing and further developing the country's ICT policies and guidelines.

Limitations to Making the ICT Sector Climate Resilient

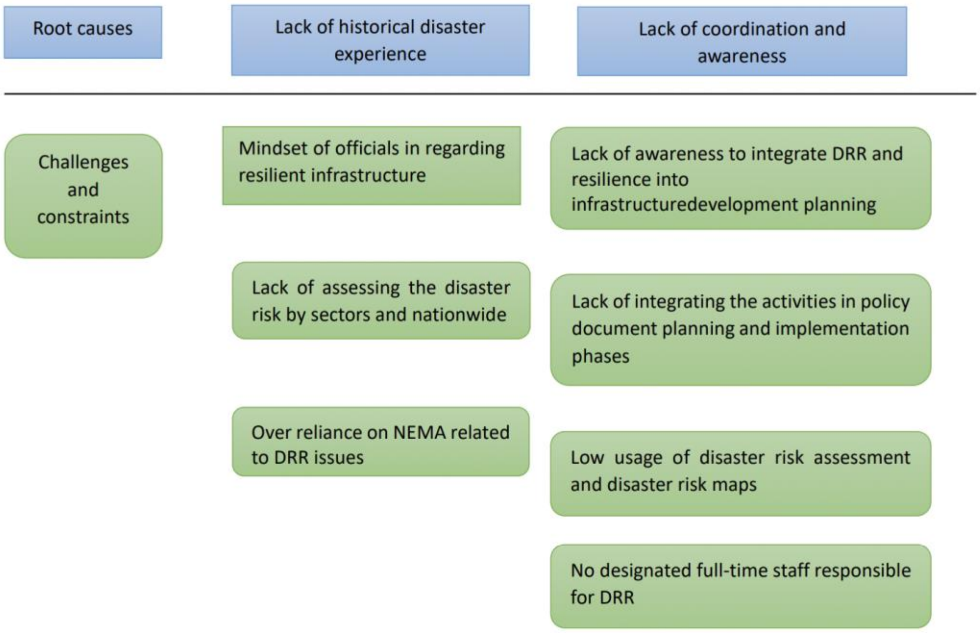
As identified above, the country has recently initiated climate change adaptation and climate resilience efforts, with the NAP preparation channeling them. Lack of a long-term national climate related disaster risk reduction experience resulted in little provisions at present being in place and in little cross-cutting cooperation between sectoral Ministries. In particular, the ICT sector has not been recognised as climate vulnerable: its development-in-progress status and the country's low population density prevented major damages in the sector and, possibly, mask exposure to such future damages (ESCAP, 2020).

Institutionally, the national and sub-national Councils on Disaster Risk Reduction and Emergency Commissions constitute a very positive set up to mainstream DRR at all levels of the country's activities. In addition, every sectoral Ministry holds the mandate to undertake data collection and make hazard forecasting. However, de facto, NEMA has been assessed to be the only agency actively responsible for disaster resilience (UNECE, 2018).

Budget allocated to disaster risk reduction is smaller in comparison with disaster response and recovery budgets, which prevents stakeholders from adopting a proactive rather than a reactive approach (UNDP, 2019).

These matters remain to be addressed to optimise the country's climate resilience efforts.

Figure 2: Causes, challenges and constraints framework for integrating DRR and resilience into the infrastructure development plan in Mongolia



Source: ESCAP, 2020

Source: State Committee for Industry, Energy and Subsoil Use of the Kyrgyz Republic, 2017. http://www.gkpen.kg/index.php/2018-01-06-09-25-07

III. ICT Climate Resilience Action Plan and Supporting Policy Recommendations

Based on the context, challenges and initiatives identified above as well as based on learnings from relevant benchmark international practices, the present section identifies a set of steps most suitable to mainstreaming climate adaptation into the ICT sector. It highlights short, medium and long-term steps Mongolia can undertake to integrate climate adaptation into ICT development projects. These steps include conducting a sectoral climate change risk and vulnerability assessment, developing a climate resilient sectoral action plan, mapping legal and regulatory provisions required to facilitate its implementation, and linking pilot projects to climate finance.

Assess Climate Exposure of Present and Future ICT Sector's infrastructural Assets

Conclusions of the ESCAP report Mongolia - Climate Change and Disaster Risk Profile (March 2021) can be taken as a basis for an initial climate risk and vulnerability screening of the ICT sector's infrastructural assets. This assessment needs to be deepened for most important existing and planned infrastructural assets to identify each most critical asset's specific level or exposure. To achieve a tangible outcome in a reasonable timeframe, it is recommended to **start with 3 most important assets** for the country's socio-economic development. The section below details a number of sub-steps to undertake to identify these 3 assets and assess their climate exposure.

I. **Map locations of present and planned future ICT sector's infrastructure development assets in GIS**. A focus can be placed on the country's most valuable ICT sector's infrastructure assets, both in terms of investment cost and in terms of their importance for the country's socio-economic development. Such assets could be cables, mobile towers, data centers, backup generators, surge control systems, etc.

II. **Identify and feature areas most prone to climate change related natural hazards in GIS.** Ideally, a spatial analysis of localized historical and future climate trends should be conducted. However, if such an analysis is not yet institutionalized as a regular national activity, to optimize the time and the cost of this activity it is recommended to conduct a fast-track mapping first and to conduct a localized analysis of only selected areas at a later stage. To do so, it is recommended to utilize maps of natural hazards based on historical data and indicate areas in which natural hazards are most likely to be further enhanced by identified future climate change patterns.

III. **Overlay these maps to identify location of most exposed key present and future infrastructural assets**. Based on the outcome, prioritise 3 most valuable and most exposed assets located in highly exposed areas. These will be taken for an in-depth climate risk and vulnerability analysis.

IV. **Downscale climate change projections and conduct an in-depth climate risk and vulnerability assessment for the 3 priority local areas corresponding to the 3 priority assets identified above**. While a country level climate change assessment may be helpful at the initial mapping stage, it is not sufficient to accurately assess climate risk in a local area. Indeed, local past and future climate patterns may significantly differ from the average national pattern. This step will hence allow to better assess climate risk and vulnerability and help take informed decisions going forward.

Assess climate vulnerability of present and future ICT sector's infrastructural assets

I. **Assess the priority exposed assets' level of climate disaster related coping capacity**. Climate vulnerability of an asset depends not only on its exposure related to its location, but equally on its coping capacity.

II. **Assess the opportunity and the relevance of alternative locations for the future strategic assets** among assets identified under step 1.4. If planning an alternative location for a vulnerable asset is feasible while maintaining its anticipated output, this option may be more cost effective than climate proofing an asset in an exposed area.

III. **Assess the cost of climate proofing the identified vulnerable assets** and compare it with the estimated post damage repair cost, taking into consideration the estimated intensity and frequency of anticipated natural disasters assessed in Step 1.

IV. Conclude with an **optimal cost-benefit solution** which strengthens climate resilience of the 3 priority assets.

Case Study 1: Cost effective ICT equipment protection with sandbags, Brazil and Peru

Summary of project outcomes

An up-front climate change preparedness leads to efficient and cost-effective climate resilience solutions.

Detailed project content

Telefónica, Spanish multinational telecommunications company largely operating in Europe and South America, has a dedicated Climate Change and Energy Efficiency Office. This office helps the company assess, mitigate and control global and local climate change related risks, which could disrupt the company's operations. A set of guidelines and procedures are described under an action plan covering all company's activities.

Such an up-front preparedness allowed the company to identify accessible and effective solutions to potential climate induced disasters. For example, Brazil and Peru have lately experienced extreme rainfalls leading to floods which put a number of Telefonica's infrastructure sites at a risk of a damage. As a prevention mechanism, the company identified that simple sandbags could be used to protect network appliances. The solution consisted in locking the doors of network centres with sandbags from both sides. As a result, equipment remained safe during floods at nearly no additional cost.

Lessons Learned:

- Assessing potential impacts of extreme weather events on the ICT infrastructure helps understand the sector's adaptation needs;
- An action plan prepared in advance allows timely taking appropriate measures, which avoid or minimize potential damages;
- Effective solutions can be very cost-effective.

Figure 3: Locking the door with sandbags to prevent floodwater from affecting network sites

Source: ITU 2014

Prepare a Sectoral Climate Resilience Action Plan

I. Prepare a detailed action plan to make the identified priority transport assets climate resilient

Extreme temperature and heat waves

Mongolia is likely to face a temperature increase of 2.1 to 2.7 °C by the mid-century, which will exacerbate temperature extremes. These, in turn, reduce the efficiency of ICT infrastructure. A number of strategies can help adapt the ICT infrastructure to heat.

Extreme precipitation and flood.

While average annual monthly precipitation is anticipated to increase by only 2.3 to 2.8 mm by mid-century, flash floods tent to become more frequent. For example, Umnugovi province was

Energy sustainability

Operating ICT infrastructure requires as much as 2 to 3% of total energy consumption in a country, which contributes to its carbon footprint. ICT's full dependence on power grid may generate vulnerabilities related to potential power shortages during disasters related blackouts. Alternative sources of power supply act as a climate resilience measure and may also help reduce ICT sector's CO_2 emissions.

<u>Case Study 2:</u> Sustainable urban transport for Ho Chi Minh City (HCMC) mass rapid transit line 2, Vietnam

Project Content

Coastal part of Brazil experiences high temperatures during the summer season. Telefónica-Vivo, a mobile operator for Telefonica in Brazil, partnered with a local company specializing in fiberglass technology to slightly modify the inside of lighting poles and include ducts which maintain air circulation and cool the wires. Equipment of network sites was placed underground to minimise its exposure to heat.

Lesson Learned

- Adapt existing infrastructure and move above ground facilities below ground can be an effective measure to minimise effects of increasing heat on ICT equipment.

Figure 4: Telefonica Brazil adapted its infrastructure to minimise the impact of temperature increase

Source: BNAmericas

<u>Case Study 3:</u> ICT sector's climate resilience post hurricane Sandy, New-York, United States

Summary of project outcomes

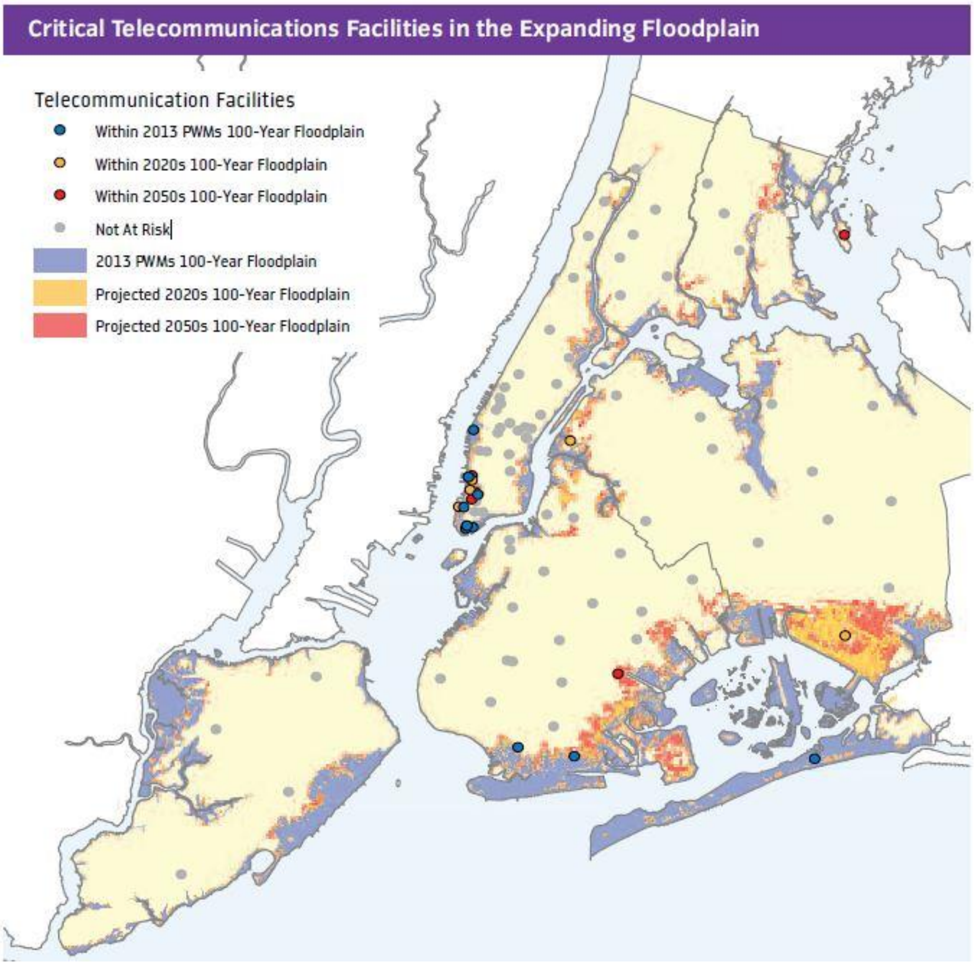
Hurricane Sandy allowed New York City to understand its ICT sector's vulnerabilities and develop climate resilience measures.

Detailed Project Content

Hurricane Sandy led to a major ICT failure in New York City (NYC) in 2012. Power cut-off deprived homes and in commercial enterprises from access to internet. Flood damaged supply service cables in buildings. Climate change studies concluded on the likelihood for the city to be further affected by coastal storms and hurricanes, sea level rise and high temperatures. As a result, the city developed a comprehensive plan A Stronger, More Resilient New York. Based on learnings from hurricane Sandy, a number of recommendations were developed:

- During the hurricane, 2 buildings (140 West Street and 104 Broad Street) were able to restore their ICT services promptly due to the fact that their generators and electrical equipment were already raised up;
- Fibre optic cable and new coaxial cables were found to perform better compared to copper cables. Encasing cables in plastic or another waterproof material also allows to limit the damage and reduce the repair cost;
- Post Sandy, a detailed risk mapping for critical ICT infrastructure was undertaken over the range of 50 years to understand potential future climate effects on the sector;
- The city established an office within the NYC Department of Information and Telecommunication (DoITT) in charge of ICT sector's resilience.

Figure 5: Risk assessment mapping: Impact of climate change on telecommunications



Source: NYC

Energy Sustainability

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Case Study 4: Alternative power supply for the ICT sector in Africa

Summary of project outcomes

Solar energy was utilised as an alternative power source for the ICT sector.

Detailed project content

To meet the energy demand of mobile network sites in developing countries where power supply is a critical factor, Orange identified a cost effective, reliable and hybrid solution of using solar energy as an alternative for source of power supply. The technology was deployed over 2,600 stations in the rural and desert areas of Africa. The intervention brought a number of benefits:

- Reduce but not eliminate fuel consumption required to run diesel generators so that generators can still be run in case of a bad weather or of an emergency;
- Up to 25% of surplus power was produced and supplied to neighbouring villages;
- A shift to direct current eliminated invertors, which were required to cool compressor motors.

Lessons learned

- Making network station self-reliant with simple renewable source is reliable source in context of developing countries where power supply is critical factor;
- Powering base station with backup supply is effective way to maintain continuity in network services;
- The case has exemplified the redundancy of network sites where solar energy is leveraged.

Figure 6: Solar station at a mobile network site in Senegal

Source: http://goo.gl/QDfz5j

II. Utilize the above recommendations as a benchmark to indicate direction of action for other vulnerable sectoral assets and, if time and resources allow, prepare a **holistic Sectoral Climate Resilience Action Plan**. Alternatively, pilot implementation of the action plan prepared under step 3.1 could be tested and the sectoral action plan could be prepared based on lessons learned from it.

Analyze barriers to implementing the action plan and prepare policy recommendations

I. **Identify legal, regulatory and governance provisions** preventing activities identified in the action plan from getting implemented. Identify revision points to these provisions as well as new provisions required to support the implementation of the action plan.

II. **Prepare a set of policy recommendations** which aim to support the implementation of the Sectoral Climate Resilience Action Plan.

Based on barriers identified under activity 4.1, identify relevant best practices and elaborate a set of policy, regulatory and governance measures which support mainstreaming of climate resilience into the ICT sector. Measures which integrate climate resilience with an effective greenhouse gas emissions reduction, or climate change mitigation, should be identified in priority.

Based on study of Mongolia's ICT sector's climate change impacts, existing institutional and policy framework, and the case studies, the following recommendations are developed to build country's ICT sector resiliency:

- **Mainstream climate change adaptation into the ICT sector.** At present, key national policy documents regard ICT as a solution enhancing the country's climate resilience. However, these policies do not indicate how to ensure climate resilience of the ICT sector itself, without which it will not be in a position to play the role it has been assigned in mitigating climate induced disaster related damages in the country.

- **Improve citizen and stakeholder awareness of climate change and related disaster risks.** The ICT sector can sizably support these efforts which, in turn, will allow ICT related stakeholders foresee climate resilience solutions for the sector itself.

- **Include climate resilience provisions into ICT infrastructure related norms and standards.** Lack of such standards usually leads to approving projects with the lowest capital cost at the expense of a much comparatively higher lifecycle cost. As case studies above identified, requiring an ICT project to move above ground equipment to below ground in areas affected by heat, covering cables with water resistant plastic and utilizing co-axial cable materials instead of copper to withstand floods and higher temperatures will ensure the sector's resilience in the intermediate future.

- **Enlarge budget allocations to climate resilience and disaster risk reduction activities** versus dedicating the majority of funds to disaster recovery so that public funding is optimised in the long run and damages are avoided to the extent possible.

The United Kingdom analysed in depth its ICT sector's climate vulnerabilities and identified a set of preventive actions.

Case Study 5: Adapting the ICT Sector to the Impacts of Climate Change – United Kingdom (UK)

Summary of the policy

The UK analysed in depth climate vulnerabilities of its ICT sector and developed recommendations on enhancing its climate resilience.

Detailed Project Content

The UK government commissioned a study on climate risks affecting the ICT sector in the UK. The resulting report on Adapting the ICT Sector to the Impacts Climate Changes shared details on the status of ICT in the country, climate risks which could affect the sector, consequences and business implications of these risks. Based on this analysis, it proposes sectoral adaptation measures and examines challenges/barriers to implementing them.

The report was prepared based on an evidence review and a series of stakeholder workshops. The evidence review collected quantitative data and knowledge and workshop gathered qualitative data across academia, governmental agencies and practitioners.

Key elements of the report include:

- Cause to effect climate change scenarios for the ICT sector. Different climate variables were considered and their associated risk for ICT identified. For example, increasing temperature would pose a risk of overheating data centres;
- Interdependencies. The ICT sector closely depends on other interrelated sectors. It is fully reliant on energy supply, global supply of equipment, data storage and data centres outside the UK, which too may be vulnerable to climate change impacts;
- Barriers to action and their implications. For example, low awareness on the ICT sector's climate vulnerability leads to little climate change adaptation action.

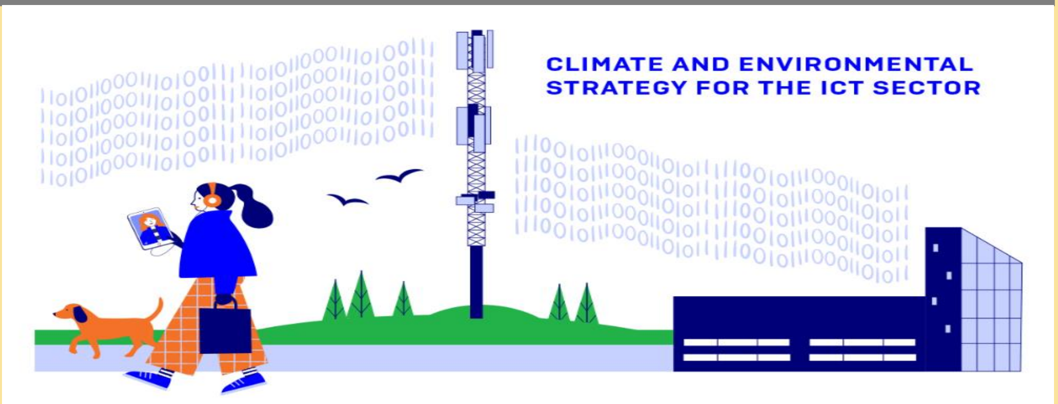
A number of recommendations to improve the ICT sector's climate resilience include:

- Build awareness among the ICT sector's stakeholders: leverage technology and governmental funding to enhance research and use of cloud computing for data transfers, inform on potential impacts of climate change building, set up inter-stakeholder collaborative frameworks;
- Enhance the planning and business processes: locate key network centres and infrastructure in climate and disaster safe areas, and mainstream climate resilience into procurement and contractual processes;
- Improve response to extreme weather events by making use of early warning systems;
- Give particular attention to weaker parts of the sector, such as rural areas.
- Adopt climate resilience supporting standards;
- Support climate risk management with climate resilient ICT.

Lessons learned

Ongoing NAP preparation process can be utilised to mainstream ICT sector's specific climate resilience provisions given its importance for the economy and for building climate resilience of other sectors in the country.

Figure 7: Climate and environmental strategy for the ICT Sector, UK; Source: Ministry of Transport and Communications



Source: AEA 2010

Identify sources of finance for the priority assets' climate resilience strengthening

Once the Steps 1 to 4 are completed, the last mile connectivity to implementing the identified set of actions is to link them to finance. Indeed, often times, funds required to implement sectoral climate resilience activities are not budgeted and secured. On the other hand, climate change adaptation is increasingly supported by international financial institutions such as the Adaptation Fund, the Global Environment Facility (GEF) or the Green Climate Fund (GCF). These institutions are mandated to support projects which set climate change adaptation benchmarks at the national level and generate tangible climate adaptation benefits for the beneficiary country.

During COP26, Japan pledged an additional 2 billion per year for the next five years, and Italy pledged an extra $1.4 billion per year towards helping developing countries adapt to climate change impacts. More than 450 banks, pension funds, insurers and other firms that collectively manage $130 trillion committed to use their funds to reach net-zero emissions by 2050. In addition, policies of most multilateral and bilateral development banks as well as a large number of post COVID-19 recovery opportunities are connected to a green recovery. Projects increasing sectoral infrastructural climate resilience can hence tap into the internationally available climate finance and set a benchmark for their respective sectors. Steps 1 to 4 are therefore highly likely to unlock access to climate finance for the country. Step 5 focuses on identifying most suitable sources of climate finance and unlocking this funding opportunity for the country.

Climate finance can be regarded as one of the sources channeling the required investments into the country while making the sector climate resilient. Step 5.1 consists in identifying the most suitable climate financial entities to submit the three projects aiming to enhancing climate resilience of the 3 priority transport assets identified under activity 1.3. These entities would belong to the following categories:

- Financial institutions dedicated to climate finance;
- Multilateral and bilateral development banks;
- National governmental mechanisms when available;
- National private sector mechanisms when available.

Conclusion

The present report identified a number of generic structural and non-structural climate resilience measures relevant for the ICT sector in Mongolia. It outlined a 5-step approach, which will assist the country in understanding sectoral climate vulnerabilities in detail, identifying priority assets at high risk, increasing climate resilience of these assets and identifying key barriers to a successful climate change adaptation of the ICT sector. Undertaking these steps will allow Mongolia to identify key local challenges to address through implementing pilot projects, to prepare a national ICT climate resilience framework and to unlock existing climate finance and green recovery funding opportunities.

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